

# **Position Paper: Secondary and Cumulative Impact Assessment in the Highway Project Development Process**

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## **INTRODUCTION**

The National Environmental Policy Act of 1969 (NEPA) directs Federal agencies to examine the consequences of proposed activities in the light of an overall goal to protect and enhance the human environment. The agencies must examine direct and observable effects plus those that may be indeterminate and not easily recognized. Effects which can be both difficult to identify and evaluate are grouped into the general categories of secondary and cumulative impacts. This policy paper addresses secondary and cumulative effects and suggests some possible ways to incorporate their consideration into the highway project development process. Please note that this paper offers only suggestions and "rules-of-thumb" for secondary and cumulative impact analyses. The paper does not prescribe any particular approach, technique or method. Instead, it approaches the subject with general analytical outlines and offers suggested ways that an agency may integrate its own specific assessment technique into project decisionmaking.

Guidelines prepared by the Council on Environmental Quality (CEQ), for implementing NEPA broadly define both secondary and cumulative impacts. Secondary effects are those that are "caused by an action and are later in time or farther removed in distance but are still reasonably foreseeable" (40 CFR 1508.8). Generally, these impacts are induced by the initial action. They comprise a wide variety of secondary effects such as, changes in land use, water quality, economic vitality and population density. Cumulative effects are impacts which result from the incremental consequences of an action when added to other past and reasonably foreseeable future-actions (40 CFR 1508.7). These impacts are less defined than secondary effects. The cumulative effects of an action may be undetectable when viewed in the individual context of direct and even secondary impacts, but nonetheless can add to other disturbances and eventually lead to a measurable environmental change.

## **BACKGROUND**

The Federal Highway Administration (FHWA) implements NEPA and the CEQ guidelines with its environmental regulations at 23 CFR 771. The regulation describes documentation requirements and procedures for environmental clearances. Concerning secondary and cumulative impacts, the FHWA regulation interprets the CEQ guidelines in a unique way. Under our regulations these impacts are referenced when justification is required for the use of categorically excluded actions. In 0771.117, Categorical Exclusions (CE) are actions which "do not induce indirect significant impacts to planned growth or land use..." or "...do not otherwise, either individually or cumulatively, have any significant impacts." Thus in 0771.117, the FHWA regulations acknowledge that these impacts exist and must be included in project decisions. Beyond this section no distinction is made between significant impacts because it is the impacts which are significant that determine the document to be used, and not whether they are direct, secondary or cumulative.

The FHWA supports its environmental regulation with Technical Advisory (TA) 6640.8A on the preparation of documents. While the regulations describe document type and associated procedures, the TA covers preparing the documents defined in the regulation. The TA provides insight on the type of secondary impacts that should be discussed for certain environmental topics. These areas generally involve resources that exhibit induced changes from project activities. Environmental resources that can be sensitive to induced change are things like the social and economic structure of a community, floodplains, and area-wide water quality. The TA gives no specific treatment to cumulative impacts, although there is implied coverage on many of the same areas covered for secondary effects.

The limited treatment of both secondary and cumulative impacts in the agency's guidance documents may reflect the overall role that these considerations play in environmental and project location decisions made by FHWA and the State highway agencies. In most cases, the anticipated direct impacts of a proposed action play an almost total role in affecting decisions on highway location. Only seldom do secondary and cumulative impact considerations effect these decisions. This is understandable since we base the majority of our decisions on information that is measurable, easy to verify, and depicts a direct cause and effect relationship between an action and its consequences.

The role of secondary and cumulative effects over the years of FHWA/State decisionmaking under NEPA has not changed to any extent. Ways to incorporate secondary and cumulative impact consideration have

not developed as have our techniques and procedures for incorporating direct impact considerations. In almost every area of environmental concern we have developed techniques of measuring and analyzing the direct impact of highway proposals. This has been accomplished through years of trial and error coupled with specific research funded to address areas of concern. Unfortunately, these activities have not addressed secondary and cumulative impacts. Our efforts to improve both identification and analysis of impacts have centered naturally on those areas of the most visible and immediate concern.

### **A NEW EMPHASIS**

Regardless of this history, secondary and cumulative impacts will become important issues which will temper decisions made by FHWA and the State Highway Agencies (SHAs) on project scope, location, and mitigation. To fulfill the general NEPA mandate of environmentally sensitive decisionmaking, the FHWA and the States must develop and use techniques to incorporate secondary and cumulative impact issues in the highway project development process. The techniques must ensure that social, economic and environmental impacts are analyzed in both the present and future context. The SHAs and FHWA must establish a way to make one public interest decision with the assurance that all relevant impact issues were studied. We cannot assume necessarily that impacts which are difficult to recognize and evaluate have no bearing on our decisions. Since we are making decisions that shape the future, we must consider the ramifications of those determinations beyond their immediate effects on the existing environment.

The FHWA Environmental Policy Statement (EPS) issued in 1990 calls for assurances to minimize future social, economic and environmental impacts. Additionally, under the recent Intermodal Surface Transportation Efficiency Act, the FHWA must now work with the State highway agencies as never before to preserve and enhance environmental resources while implementing transportation improvement programs. These commitments will require that equal weight be given to environmental issues during the project decisionmaking process that normally emphasizes engineering considerations.

The new emphasis on environmental issues must include techniques that produce the best possible public interest decisions on project features such as, location, design and mitigation. These decisions will represent a balance between environmental, socio-economic, and engineering issues. Therefore, we must assure full consideration of environmental concerns from the early stages of planning and throughout project development. Full consideration means that a interdisciplinary approach is used to evaluate social, economic, and environmental effects to produce a systematic analysis of project impacts. The results of this analysis under NEPA support one-time decisions fulfilling the public interest in transportation improvement, safety, environmental quality, and the protection of communities.

These mandates place new emphasis on the examination of secondary and cumulative impacts. That is, the FHWA and the SHAs must produce systematic analyses of environmental, social and economic impacts of sponsored projects that include coverage of secondary and cumulative effects. Otherwise, the analyses most likely will be incomplete under the FHWA commitment to comprehensive environmental and public interest decisionmaking. This responsibility for informed decisions requires the collection and presentation of all information relevant to the project, including the indirect consequences of the proposed action in relation to area-wide environmental change. Ways should be established to incorporate these considerations into the highway development process. Project approvals should be based on analyses of impacts that go beyond studies of only the immediate and direct effects which have traditionally supported our decisions.

### **APPROACHING SECONDARY AND CUMULATIVE IMPACT ASSESSMENT**

A systematic procedure to examine the secondary and cumulative effects of proposed highway improvements will most likely emerge from established methods of evaluating cause and effect relationships. Many of these methods are those currently used in situations where we must produce comprehensive examinations of special-interest or priority environmental features.

An example would be studies conducted to determine possible effects of a highway improvement on a species listed as endangered under the Endangered Species Act. Knowledge of past and present pressures from both the proposed project and outside forces is essential to determine whether or not a project is expected to jeopardize the continued existence of a protected species and its habitat. Studies would include estimates of the rate of habitat loss by various activities and the susceptibility of the species to these pressures. Once this information is gathered and assimilated into a single analysis, the individual effect (contribution) of the highway project gains perspective and conclusions on the proposal's impact to the species are possible.

Another example is the effort required to predict and assess the effects of residential, business, and community service losses caused by a highway project. Studies must include secondary effects and influences from outside developmental pressures to determine the ability of an area to survive removal of housing, businesses, and community services. Also, such studies must describe a community's ability to absorb relocated residents and businesses in terms of social and economic disturbance (available housing, public services affected, areas zoned for business use, etc.).

A similar thought process may be followed for the examination of wetland impacts. During impact assessments, wetlands are not considered as isolated resources, but instead as integral features of the natural environment. The recognized values of wetland habitats indicate this integral relationship. Their effect on water quality improvement, for example, may be generated through a combination of factors that, when viewed individually, exhibit little or no influence. Communities may depend upon the water quality functions provided by wetlands interacting with other environmental features that are often quite removed from the immediate area in question. The specific interaction may also occur years before the benefit to the community's water supply is realized.

Emerging from these examples are the following concepts:

1. Secondary and cumulative consequences are triggered by impacts to environmental resources that function as integral parts of a larger system.
2. Since the resource functions may be removed in both distance and time, secondary and cumulative consequences to the larger system may likely be 'invisible' to normal environmental studies that examine only the immediate influence of an isolated project.

Therefore, an examination of secondary and cumulative consequences should focus on the functional relationships of resources with larger systems. If these relationships are understood, then conclusions on a project's likely secondary and cumulative impacts to the overall system should be possible.

One way to describe the relationship between a specific resource and a larger system is as a cause and effect interaction. For example, how do impacts to a specific wetland influence the quality of a region's water supply? Or how does the loss of a specific business affect the economic vitality of a community? These questions may also be asked in the context of multiple resources: How do wetlands of a particular type in a particular association influence regional water quality? What types of business (retail, food service, etc.) effect community economics?

These relationships may be determined in specific or general terms depending upon how much is known about a particular resource. For example, the FHWA and SHA project sponsors may know that X acres of a specific type of wetland are required in the watershed in order to maintain a level of water quality which does not burden the treatment capacity of a downstream drinking water facility. This may be a very specific and well-defined functional relationship that equates a certain threshold with a predictable result. If a proposed highway project will take the existing wetland acreage below the required threshold level, then a predictable secondary effect should occur: the water treatment plant will not be able to handle the added pollutant load resulting from the wetland loss.

Moreover, if the project is combined with other actions collectively and contributes to impacts which exceed (or reasonably will exceed in the future) the wetland acreage threshold, then the same predictable consequence will occur, only this time as result of cumulative actions. By comparing the impacts of the highway project with the effects of the other actions, the relative contribution of the highway improvement to the projected cumulative impact may be estimated.

Unfortunately, well-defined functional relationships between resources and the larger environmental systems upon which society may depend are seldom available to the decisionmaker. Usually, nothing more than general cause and effect relationships are understood. Secondary impacts in this regard may be much more discernible than cumulative. Conversely, there may be situations where there is confidence that a specific relationship definitely does not occur. An understanding that no relationship occurs can be just as valuable in predicting the consequences of a proposed action.

It may be more helpful to view these relationships not as absolutes, but rather in degrees of understanding. Understanding can be spread over a continuum from fully defined to undefined as depicted in the following diagram:



KNOWN RELATIONSHIP  
(Related or unrelated)

NO KNOWLEDGE OF  
ANY RELATIONSHIP

The point at which a particular relationship falls on the continuum depends on the degree of confidence we have in understanding the interaction of one or more resource elements with the larger system. Likewise, the confidence we have in predicting the secondary or cumulative consequences of a project should be based on what we know about these relationships. This degree of confidence will be based on what is known about a possible relationship either through research results, cause and effect observations, or professional judgment supported by education and experience.

Our confidence level should also define the effort required to address secondary and cumulative impacts during environmental analyses, documentation, and mitigation. Generally, the higher confidence we have in understanding functional relationships, the more we should expect on the coverage of secondary and cumulative effects during the analysis and documentation of project impacts. Conversely, when relationships are largely undefined, a more general coverage of secondary or cumulative consequences (or lack of) is all that is necessary. In these cases, the environmental document should state "that the knowledge of relationships necessary to make more definitive findings about indirect impacts is simply not available and cannot be reasonably determined under our current capabilities."

**WHEN ARE SECONDARY AND CUMULATIVE IMPACT ANALYSES APPROPRIATE?**

Under the CEQ regulations, the FHWA must consider the possibility of secondary and cumulative impacts on all agency actions. However, we will obviously concentrate on construction actions which have a potential to produce indirect environmental consequences. Secondary and cumulative impact analyses should be based on the possibility of indirect effects combined with various site specific conditions which will shape the scope and intensity of the studies necessary to provide adequate information to the project decisionmakers.

An important consideration is an estimate of the potential for development in the area of a proposed project within a reasonable period of time. The estimate should recognize the potential both with and without the project. In areas experiencing little growth over time, an individual highway project will likely have a negligible contribution to a cumulative impact because of the absence of other activities occurring in the vicinity. Conversely in areas of moderate to rapid development, the contributions of a highway improvement can be a measurable element of the aggregated change leading to long-term impacts. The potential for secondary and cumulative effects, and thus the need to conduct specific analyses to determine the possibility of impacts, also depends upon the type of project being proposed. Capacity improvements, additional interchanges and construction on new location generally have a greater potential for indirect effects than projects to upgrade existing facilities. New access into undeveloped locations can contribute to subsequent development activity. In some instances the stated purpose for proposed projects may be to promote economic development in depressed areas needing overall infrastructure improvement. In cases like these, a discussion of indirect effects should be included in the project environmental analysis. Without it, the project purpose and need will be difficult to defend and any decisions to proceed with the project may likely be challenged.

**CONDUCTING SECONDARY AND CUMULATIVE ANALYSES**

As stated in the opening of this paper there are no clear-cut techniques to determine the secondary and cumulative consequences of highway project proposals. Nevertheless, in situations where the potential for indirect impacts exists, the likely consequences beyond direct project impacts should be determined with the greatest amount of confidence possible. The following general concepts are offered as a suggested decisionmaking framework to incorporate secondary and cumulative impact considerations into the highway development process:

1. The consideration of possible secondary or cumulative effects should begin in the planning stages of the highway project development process. Early activities can provide indications of links that a proposed project may have with other programmed development and area-wide resource management plans for wetlands, air quality, water quality, etc. Such plans may indicate an area is planned to absorb specific primary, secondary, and cumulative impacts in balancing developmental needs with environmental protection. Describing a project's association with (or as an element of) these kinds of plans in an environmental document may in some cases be sufficient to describe the expected cumulative and secondary effects of the proposal. Metropolitan Planning Organizations and other development and resource protection agencies should be contacted early in the process.

2. In cases where an area has conducted little or no resource planning the assessment of secondary and cumulative impacts can be much more difficult. Often these areas have done little in the way of planning for development as well. The limited information available will mean more effort will be required to contact and coordinate with various sources having knowledge about changes occurring in the area of the project. Local entities, such as zoning boards, water quality control departments, and building inspection agencies can be invaluable sources of information. In these circumstances, past history can sometimes be the best indicator of future development patterns.

3. Once information about the project area is available it should be determined whether developmental changes are occurring and whether continued growth in the future is expected. The same would also apply to current and anticipated changes to environmental resources. Include information on the susceptibility of the resource base to developmental changes known to be related to highway improvements.

4. Information on development trends in the area should then be related to the scope of the project proposal. The area to consider should be that defined by the extent of the project's influence. The project's area of influence may be defined as appropriate, considering the type project being proposed, condition of the existing facility, and other factors such as capacity, access, etc. However, an acceptable general guideline for determining the area of influence is the geographic extent to which a project will affect traffic levels. This could be through changes to current levels on existing highways and by providing the impetus for new facilities in undeveloped areas. Combining the information on resource and developmental change for the area with the scope of the project's influence yields the geographical extent of potential secondary and cumulative effects of the proposal.

5. The other element required in the analysis is time. Potential cumulative impacts, in particular, must be considered over a specified time period in order to assess the influence of a given action. On highway projects, design life is often used as a measure of how long a facility remains effective and has a contributing influence on the transportation system. Design life could also be used to place limits on the influence a specific project proposal would have on potential secondary and cumulative impacts. Although secondary and cumulative impacts may carry forward for many decades, the actual time of influence attributable to a single project should generally diminish as the facility approaches its design life. Therefore, it is recommended that design life be used as the maximum period of time that a project can be expected to contribute to potential secondary and cumulative impacts.

6. Finally, assess the indirect impacts of a highway improvement by analyzing the planned and potential development for the area influenced by the project over the life of the facility. The projected impacts of this development in total would be an adequate estimate of the secondary and cumulative effects on environmental resources in the area.

7. If this estimate indicates there is little or no anticipated future change, there is no need to continue the analysis. The conclusion would be that the highway improvement, regardless of its direct impacts, will likely have no indirect impacts.

However, if future area-wide impacts are indicated, the contribution of the project should then be estimated by judging how directly the highway improvement influences the subsequent development. If the influence is low, the contribution of the highway is likewise low; i.e. the proposal likely has minor or no secondary and cumulative impact. If, however, the highway has a clear link to or was planned to promote the subsequent development, the contribution is high and secondary/cumulative impacts attributable to the project are likely great.

8. After the analysis is complete a valid question will remain: If a proposed highway improvement is determined to cause potential secondary and cumulative effects, what can and should be done to mitigate the adverse impacts? This is a difficult question for which there are no simple solutions. Consistent with existing FHWA regulations mitigation proposals must be both reasonable and related to project impacts. However, the opportunities for environmental enhancement that are now available under the highway program may greatly expand our traditional view of mitigation. Changing a proposed transportation improvement to lessen its contribution of indirect impacts may likely result from a combination of mitigation and enhancement measures that address area-wide concerns, not just the immediate influence of the project. Unfortunately, measures that would be appropriate to offset most future developmental impacts in the area of a project often will be beyond the control and funding authority of the highway program. In these situations, the best approach would be to work with local agencies that can influence future growth and promote the benefits of controls that incorporate environmental protection into all planned development.